

THE INTERACTION OF APTITUDES AND TREATMENTS
IN THE TEACHING OF WORD RECOGNITION

By

JUDY OLSON

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Abstract of Dissertation Presented to the Graduate
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THE INTERACTION OF APTITUDES AND TREATMENTS
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By

Judy Olson

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Chairman: Dr. Cecil Mercer
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The purpose of the study was to investigate the interaction of particular individual characteristics or aptitudes with two strategies for teaching isolated words to a Specific Learning Disabilities population. A total of 64 males, 16 from each age group of seven-through ten-year olds, participated in the experiment.

The individual characteristics of short term memory performance and chronological age were selected as the aptitudes. Each subject was administered the Auditory Attention Span for Unrelated Syllables subtest of the Detroit Test of Learning Aptitudes and the Auditory Sequential Memory subtest of the Illinois Test of Psycholinguistic Abilities as measures of short term memory aptitudes. Performance on each subtest was

evaluated separately. Chronological age was also calculated for each subject.

Thirty-two of the subjects were randomly assigned to the category-cued treatment and 32 to the random drill. In the category-cued treatment, the 16 words were grouped into four categories of four words each and all the words from each category were presented together. The four instances of each category were preceded by the experimenter's labeling of the categories. In the random drill strategy the 16 words were presented in random sequence so that no two words from the same category ever appeared together. No cues were given.

The interaction of treatment and individual characteristics was evaluated for word recognition immediately after the study trials, 24 hours after the study trials, and a week later after either a performance or trial criterion was reached. Multiple regression analysis of Aptitude x Treatment interactions produced no significant interactions for any of the three dependent measures.

CHAPTER I INTRODUCTION

Studies dealing with the effectiveness of presenting material to be remembered in some organized format have been investigated since the early sixties. Material organization has been recommended for both regular (Ausubel & Fitzgerald, 1961) and special educators (Chalfant & Scheffelin, 1969; Hallahan & Kauffman, 1976; Lerner, 1976; Spitz, 1966) to aid children in the storage and retrieval of information. One of the techniques frequently used to organize words consists of placing the words into predetermined conceptual categories (i.e., all the food words together, animal words together, etc.). Furthermore, in some studies, the subjects were informed of the particular organizational structure via verbal labeling of the categories before the presentation.

Numerous investigations have shown this "categorical" technique of organizing input to be effective in verbal learning research where the subjects were required to recall a list of words or to associate one word with another. The positive results from the verbal learning studies have led many educators (Bannatyne, 1971; Freston & Drew, 1974; Parker, Freston & Drew, 1975; Ring, 1975) to speculate that the categorical

strategy of organizing input might be an effective method for teaching academic skills to children with Specific Learning Disabilities (SLD).

The organization of words into distinct categories has been specifically recommended for teaching the academic skill of word recognition by Westling and Mercer (1977). The academic skill of word recognition is similar to the verbal learning task of paired-associate learning where the student is given a printed stimulus to which he must associate a verbal response. From their analysis of past organization input research, Mercer and Snell (1977) further suggested that the task should include "instructions which point out how the assigned words are grouped into categories" (p. 75).

This recommended strategy of teaching isolated words through the preorganization of the words into categories with labeling at input (category-cued) can also be viewed as adding meaning to the normal rote task as the labels provide an association or anchorage between the new learning and past learning. Ausubel and Fitzgerald (1961) theorize that organizing information into more meaningful material leads to easier retention as it relates new learning to concepts that are already familiar to the learner. The category-cued technique links the words to be learned to categories that the children are familiar with from past learning. In

contrast, the common drill method of teaching word recall (referred to as random drill in this study) where the teacher presents the word to be remembered on cards to the student along with the required response usually lacks an ideational anchorage provided by the teacher. Adding the verbal cueing appears to notify the subject to attend to the stimulus by focusing on the relevant dimension of how the words are alike and different and therefore, aids in stimulus discrimination.

That the category-cued technique is a more efficient strategy for the teaching of isolated words as opposed to the common drill method for all SLD children is not the hypothesis of the study. Cronbach and Snow (1969) along with others (Bloom, 1968; Gagné, 1967; Glaser, 1967; Jensen, 1967) have stressed the futility of the search for the one best treatment pursued by traditional research designs. Instead, they insist that learning effectiveness is a function of the interaction of instructional treatments and learner characteristics or aptitudes. So too in the field of special education, the premise exists that there is not one effective method for all children, but that intervention procedures are based on the individual aptitudes of each child (Wallace & McLoughlin, 1975). An aptitude is defined as any individual difference variable which

functions selectively with respect to learning and may include intellectual abilities, personality traits, interests, or cognitive styles (Bracht, 1970).

Some older SLD subjects may find little use for the organization of the new learning and the association to other concepts. They have over the years been exposed to more of these types of tasks and may have acquired other more efficient strategies simply through past experience while younger children may need the extra external associations. The investigation of Aaron, Malathesha, and Schwie (1974) disclose a possible age-related effect with the strategies.

Moreover, SLD students who have good memories may learn just as well through the constant repetition and frequent pairing of the stimulus response; whereas those children with poor memories may find the extra meaning and associations helpful. The investigations of Nelson (1969) and Drew and Altman (1970) lead to the consideration of a possible short term memory relationship. In conclusion, it is hypothesized that the selection of the most effective treatment for teaching word recognition depends on the chronological age and short term memory characteristics of the learners.

Purpose and Objectives of the Study

The purpose of the study is to determine if an interaction exists between two treatments and individual characteristics of SLD children in the acquisition and retention of isolated words. The two treatments are category-cued where the experimenter presents each word labeling the category membership and random drill where the words are presented in random order with no cues.

Four questions are investigated:

1. Which strategy considering the aptitude of chronological age results in the acquisition of the highest number of words in the fewest number of trials?
2. Which strategy considering the aptitude of chronological age results in the greatest number of words remembered over a seven-day period after the treatment is discontinued?
3. Which strategy considering the aptitude of short term memory results in the acquisition of the most words in the fewest number of trials?
4. Which strategy considering the aptitude of short term memory results in the greatest number of words remembered over a seven-day period after treatment is discontinued?

The specific objectives of the study are:

1. To demonstrate that age interacts with

treatment, i.e., younger SLD children learn the most words in fewer trials with a category-cued strategy; whereas older SLD children learn the most words in fewer trials with the random drill strategy.

2. To demonstrate the preceding relationship between chronological age and treatment when seven-day retention of the acquired words is measured.

3. To demonstrate that short term memory interacts with treatment, i.e., SLD children with poor short term memory learn the most words in fewer trials with the category-cued approach while those with adequate short term memory learn the required number of words in fewer trials with the random drill.

4. To demonstrate the preceding relationship between short term memory and treatment when seven-day retention of the acquired words is measured.

Rationale

Chronological Age Aptitude

The possibility that chronological age interacts with methods is found in the input organization literature. Researchers in verbal learning studies (Aaron, Malathesha, & Schwie, 1974; Tenney, 1975) have reported an age-related effect where younger children appeared to profit from externally imposed organization while older children seemed to use the strategy as one of many

to facilitate recall. The same effect may occur in this study where the age of the child relates to the treatment.

Short Term Memory Aptitude

Both theoretical and empirical support for the interactive effect of short term memory with organizational input is disclosed in the literature. Mandler (1967), Travers (1972), and Underwood (1964) postulate that memory is largely dependent upon some form of organization.

In his research with subjective organization, Tulving (1970) demonstrated that many subjects seemed to find memory strategies such as rote recall, mnemonic devices or other individual techniques for remembering just as useful as categorical organization. It has been hypothesized by some researchers (Drew & Altman, 1970; Nelson, 1969; Steinmetz & Battig, 1969) that subjects who do not use imposed categorical organization have adequate memory spans. However, only Nelson (1969) attempted to measure the subject's basic memory span and this was independent of treatment effects. There appears the possibility that memory interacts with treatments, i.e., those subjects with adequate memory may respond differently than those with inadequate memories. Further investigation of memory effects is therefore vital.

Definition of Terms

Anticipation Method is a procedure in paired-associate learning where the stimulus term is presented alone briefly followed by the presentation of that stimuli paired with the response during the study trial. After the study trial the stimulus is shown again and the subject must respond aloud with the anticipated correct response. Following the subject's response the stimulus is shown again paired with the correct response term.

Aptitude Treatment Interaction (ATI) is a research design which allows one to include learner characteristics as independent variables for the purpose of seeking possible interactions among them and the treatment variables.

Category-Cued Strategy for purposes of this study is the teaching strategy where the words to be presented are selected from similar categories arranged in sequential order, i.e., people words followed by eating words, etc. The subjects are alerted to the categorical organization through the labeling of the categories by the experimenter.

Contiguity applies to the various arrangements of words in terms of time and sequence. In high contiguity all words that can be associated are placed together in a sequence.

Encoding is the process by which the subject transposes information that is presented to him for better understanding and use.

Experimenter-Imposed Organization occurs when the experimenter organizes the material at input to assist the subject in recall.

Free Recall Learning is a prototypic task used in the investigation of verbal learning which involves the presentation of a list of items followed by the removal of the items and then a request for item recall.

Functional Rule is a rule that a subject creates and uses to assist in remembering materials.

Functional Stimulus is the dimension of the stimulus that the subject is attending to, i.e., subject designated stimulus.

Input Organization is the process of organizing or classifying stimuli. Either the experimenter or subject may organize the information to be recalled at input.

Maximal List is an organizational procedure used in reading research where the words to be read display a high degree of difference; that is, they do not share many common elements.

Minimal List is an organizational procedure used in reading research where the words to be read display a low degree of difference; that is, they share many common elements.

Natural Language Mediators are associations the subject uses based on verbal language connections.

Nominal Stimulus is the dimension of the stimulus the experimenter has selected as relevant for the subject's attention, i.e., experimenter designated stimulus.

Paired-Associate Learning is a prototypic task used in the investigation of verbal learning which involves the association of a response to a stimulus.

Perceptual Encoding Variability describes the phenomenon where a stimulus may be encoded by a subject in a variety of ways.

Stimulus Control measures the ability of the stimulus to elicit a particular response.

Stimulus Discrimination describes the process where a response is associated to a partial stimulus and another response to another stimulus such as the verbal response daddy is associated with the daddy figure while mommy is associated with the mommy figure.

Stimulus Generalization describes the process where a response is associated to more than one stimulus such as the verbal response mommy is associated with both the mommy and daddy figures.

Study-Test or Blocking Method is a procedure used in paired-associate learning where the stimulus-response pairs are presented one at a time followed by the test trial of stimulus items only.

Subjective Organization is the index of grouping sometimes only known to the subject.

Trigrams for purposes of this study are any three-letter combinations which may or may not form words.

Verbal Learning Tasks are ones in which the elements to be learned are linguistic in nature, and therefore, may be numbers, letters of the alphabet, individual words, or sequences of words.

Word Recognition for purposes of this study describes the academic task where a subject must associate from memory a verbal response to a visual stimulus.

Delimitations

This study is limited to Caucasian members of the SLD population. The population is defined according to the Florida state guidelines and one should examine the state definition (see Appendix A) to determine if the group is representative of the SLD population in their locale.

Another delimitation is evident in the dependent measure. As only the academic area of word recognition is investigated, the generalization of treatment effectiveness to other academic tasks is restricted.

Limitations

A possible limitation of the study which is beyond the control of the writer is the incidental presentation

of the specific words that may occur during the daily reading classes or during other school-related activities.

CHAPTER II REVIEW OF THE LITERATURE

The areas chosen for review are based on an analysis of the treatments, task, and aptitudes involved in the study. In both treatments the experimenter is presenting visual stimuli for the subject's attention. In one treatment the experimenter is trying to focus the subject's attention on particular cues while in the other the cues are to be formed by the subject. Therefore, the area of discrimination learning and experimental control of distinctive features of a stimulus are examined.

The basis for the recommendation of organizing words into conceptual categories with cueing to teach word recognition lies in organizational input theory and research. Mercer and Snell (1977) and Westling and Mercer (1977) specifically quote the results from this research as a rationale for their recommendations. Therefore, the organizational input research is reviewed.

The effects of chronological age and short term memory in verbal learning are included next as these are the individual characteristics identified as the factors for consideration of treatment effectiveness. The last

area highlighted in the review is the reading literature dealing with the skill of word recognition.

Stimulus Discrimination

A hypothesis advanced by Gibson (1940) asserts that a major necessity of verbal learning is the establishment of discriminations among the items to be learned and that this process of discrimination is actually a fundamental part of what is generally the learning process. Gibson further explains that as verbal learning proceeds, the stimuli either visual or auditory become more differentiated and distinct from one another through differential reinforcement of correct responses through informational feedback. For example, a subject learns to respond in a particular manner to Stimulus 1 and not to Stimulus 2 as that response is reinforced only in the presence of Stimulus 1.

Martin (1968) further defines discrimination learning as perceptual/encoding variability. Martin's basic assertion is that a stimulus presents an array of dimensions that may be encoded by the subject. This is referred to as perceptual encoding variability. An example of the variability in how a dimension might be encoded is found in the nonsense trigram mzo. According to Martin, when a subject is presented with this stimulus to recall, the stimulus might be processed only

as the single letter of m, or z, or o just to name a few possibilities. Unless a subject encodes the stimulus term indential on study and recall trials, the term may not invoke the same response. Martin depicts the scheme of discrimination learning as represented in Figure 1 and explains discrimination learning according to the following sequence.

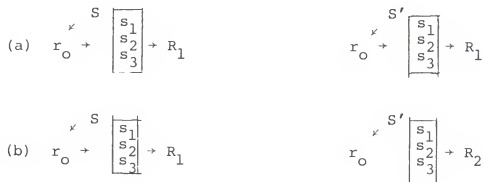


Figure 1. Scheme of Discrimination Learning

First the external stimulus (S) is presented to the subject. This is perceived by the organism in the form of an orienting response (r_0) which determines the relevant dimension of the stimuli (s_1, s_2, s_3) that will be attended to. As can be seen from the example, there are three possible ways to encode the stimuli, either by s_1 , s_2 , or s_3 . The choice of the relevant dimension produces the overt response (R).

In Task (a) the subject has not learned to attend to the relevant aspect of the stimulus (s_3) for

discrimination. Therefore, the subject generalizes the same overt response (R_1) to the different stimuli (S & S') resulting in stimulus generalization. In Task (b), however, the subject has learned to direct the orienting response to the relevant dimension (s_3), which results in different responses to the stimuli (R_1 to S and R_2 to S'). A stimuli may be connected to many orientation responses depending on one's previous learning history.

This model is explained somewhat differently by Underwood and his colleagues (Underwood, 1963; Underwood & Erlebacher, 1965; Underwood, Hamm, & Ekstrand, 1962). Underwood in his vast research with verbal learning has noted a difference between the stimuli that the researcher wants the subject to attend to (nominal stimulus) and what the subject really attends to (functional stimulus). The S in Martin's model would be considered the nominal stimulus while the s_1 , s_2 , or s_3 would be considered the possible functional stimulus. This phenomenon has been reported in transfer studies where the subjects have noted attending only to certain aspects of the stimuli. For instance, in a study conducted by Underwood, Hamm, and Ekstrand (1962), the subjects, when questioned as to the relevant dimensions of the stimuli, remarked that they used only the single letter of the nonsense trigram for discriminating purposes.

In the verbal learning task involved in this study, the discriminations made by the subject to produce the responses are manipulated. Haring (1968) envisions the role of the teacher as "one who insures that relevant dimensions of stimuli gain control over a child's responding" (p. 103).

Experimenter-Control of Distinctive Features of a Stimulus

According to both Gibson and Martin discriminations made by the subjects can be controlled by both the meaningfulness involved in the stimuli and external instructions. Gibson (1940) argued that meaningfulness is "one characteristic of a verbal or visual item which serves to differentiate it from other items, as generalization is at a minimum for meaningful material" (p. 222). Martin (1968) asserts that the variability in processing a stimulus is at a minimum for high meaningful material.

In addition, a subject may be taught discriminations or the relevant aspect of a stimulus through verbal instruction and labels (Allington, 1975; Gibson, 1965; Kanfer, 1968; Tulving & Thomson, 1973; Underwood & Richardson, 1956). That experimenters can alter the extent to which a subject selects one dimension over another of a stimulus has been demonstrated in the

paired-associate verbal learning research with color-trigram stimuli. In this task the subject is presented with a compound stimulus of trigrams (either three-letter nonsense words or meaningful words) paired with a color cue. It has been discovered that subjects when permitted to form their own discriminations will most often attend to the color cue and not the trigram to make the association. When the trigram consists of nonsense words the color choice is selected first while when the trigram is a meaningful word, the meaningfulness of the stimulus is selected first, then abandoned for the color cue (Birnbaum, 1966; Steiner & Sobel, 1968; Underwood, Hamm, & Ekstrand, 1962).

In a now classic study by Houston (1967), subjects' preference for attending to the color cue of the stimulus was changed simply by modifying instructions informing the subjects that they would be tested subsequently with the trigrams alone.

Samuels (1973) also demonstrated that an experimenter could control the stimulus attended to by the subject during an academic task of recognition of the letters b, d, p, and q. The author tested the hypothesis that visual discrimination training on noting the distinctive features of a stimulus (these features were determined by the author) would facilitate the association of letter names with symbols. The 90 kindergarten

children were assigned to three different treatments during the stimulus learning stage. In the experimental group the subjects were given visual discrimination training on noting the distinctive features of the letter set b, p, q, and d; one control group was also given discrimination training on the letter set, but not on the distinctive features; the second control group received no visual training but was given equal time exposure to the same stimuli as the other two groups. Following the stimulus learning stage, all subjects were asked to state the correct letter name for each of the four letters as the experimenter held up the letter. If the child missed the name of the letter, the experimenter told him the name and continued to the next letter. This phase was the same for all subjects and was discontinued when a predetermined criterion of one perfect trial of saying all four letters correctly or the thirtieth trial was reached. The subjects in the experimental group learned the letter names at a faster rate than either of the control groups. The control group that was exposed to the visual discrimination training, but did not have attention focused to the particular relevant dimensions of the stimuli performed no differently than the group that had no training at all.

Terrace (1966) has also successfully demonstrated that what is attended to in the stimulus by a subject

can be controlled by the experimenter in his work with errorless discrimination. His procedure essentially involved the presentation of the s+ or positive stimulus so it could be easily discriminated from the negative stimulus (s-) during the initial learning stages. Usually this was accomplished through the manipulation of duration and brightness. The s- initially appeared less bright and of a shorter duration than s+. Eventually the duration and brightness were gradually increased until both stimuli were of equal duration and brightness. Through this procedure the number of incorrect responses to the stimuli was greatly reduced.

A study performed by Shuell (1968) and replicated by Strand (1970) with adults indicated that category names could serve as the relevant feature of the stimulus in a free recall task. A list of 35 words with five words in each of the seven categories was presented in a blocked order to all subjects in the first part of the experiment. Four study-test trials were administered. Then the members in the control group were required to learn a new list of 35 words comprised of different categories and words while the experimental group learned a second list comprised of different words but the same categories. The experimental group recalled less than the control group due to negative transfer as the same category label tended to be

associated with the original response. Although Shuell was primarily interested in measuring the effects of negative transfer he concluded from the results that category names function as an "organizational" stimuli for the response: Once the association of one response was made to the categorical label, it was difficult for the organization to elicit other responses.

Summary

Research dealing with stimulus discrimination has shown that experimenters can control the way a subject discriminates stimuli through verbal instructions, verbal labels, and meaningfulness. As suggested by Gibson and Martin the stimuli in this study are meaningful to increase learning proficiency. As summarized by Kausler (1974) in his chapter on pair-associate learning, "there is a pronounced positive covariation between meaningfulness level and paired-associate learning proficiency" (p. 133).

Moreover, in the category-cued treatment, the stimuli are associated with conceptual categories and labeled to cue the subject into the relevant dimensions of the stimuli. The studies by Shuell (1968) and Strand (1970) indicated that category names could serve as the relevant feature of a stimulus.

Organizational Input

Theory

The basic tenet of organization theorists derived from Gestalt psychology is that a subject groups information to aid in recall (Bower, 1972; Postman, 1972; Voss, 1972). It is believed that material may be grouped on the basis of proximity in space or time or according to similarity of elements. According to the organization theorists, how a subject groups stimuli at input depends upon the attitudes and experiences or mental set established by prior psychological context.

This organization in turn affects memory as it leads to a reduction in the number of separate items for recall. The subject does not have to check through all memory banks but organizing the information at input results in a restricted search (Atkinson & Shiffrin, 1968; Shiffrin & Atkinson, 1969; Yntema & Trask, 1963). Tulving and Thomson (1973) consider that the success of the search has an inverse function in relation to the size of the search, i.e., reduced size leads to higher success.

Types of Organization

Subjective organization. According to this theory, organization can either be self-directed or experimenter directed. In self-directed the subject

organizes the information in a manner sometimes evident only to himself (subjective organization). Bower (1972) has identified two types of the many examples of subjective organization: cognitive mapping of functional rules and language mediation. Both identify an attempt of the subject to relate unknown material to known.

An example of the use of a function rule for recall of words that end in at described by Bower (1972) occurs when the subject arrives at the conclusion to include only those "one syllable words that rhyme with cat" (p. 167). Rhyming CVC words with cat becomes the functional rule for recalling the new words. Bower notes a frequent language mediation used by clever subjects when dealing with recall of nonsense trigrams is to add additional letters to make complete words such as bac (on) for bac. Bousfield (1965) in his vast research found that some subjects use conceptual categories for organization of information more efficiently than others.

Experimenter-imposed organization. Experimenters may impose organizational structure on the material in terms of contiguity (all words that belong to a particular category presented together, etc.), selection of items (words that belong to the same categories or words that contain similar endings, etc.), or verbal

instructions requesting that the subjects remember input in a particular manner (create visual image of words, remember the words according to categories) to name a few.

Whether the subjects select their own strategies or use experimenter-imposed ones appears to depend on the procedures employed in the study and the individual characteristics of the subjects. Many researchers (Aaron, Malathesha, & Schwie, 1974; Moely & Jeffrey, 1974; Nelson, 1969; Tenney, 1975) have reported that younger children used the categorical structure of the experimenter if procedures were employed where the children were made aware of the organizational structure.

Ausubel and Fitzgerald (1962) discovered that the individual characteristics of verbal ability and adequate background knowledge of the learning task determined whether a subject used experimenter-imposed organization. They found that students with good verbal ability and adequate background knowledge of the learning task did not require imposed organization but were more successful using their own strategies while those with poor verbal ability and limited background knowledge learned more with the imposed structure. Bower and Winzinz (1969) discovered in some cases that investigator-imposed grouping disrupted the subjects'

subjective organization of the material, but they were not concerned with the identification of the characteristics of these subjects.

Spitz (1966) in his work with mentally retarded subjects, concluded that they could not effectively relate unknown material to known material through subjective organization, but that the organization had to be provided by the experimenter.

Other researchers (Cobb & Barnard, 1971; Gerjuoy & Alvarez, 1969; Gerjuoy & Spitz, 1966; Reiss & Reiss, 1971) arrived at the same conclusion. MacMillan (1972) summarized the findings when retarded children were compared with nonretarded children in the statement that retarded children as a group relied almost exclusively upon imposed organization while the normal children exhibited a varied need as many children recalled more items when the least experimental structure was provided and they were free to use their own strategies.

Organization Studies with the LD Population

The review of the effects of experimenter-imposed organization on the LD population has also revealed that some students used the experimenter-imposed organization while others performed equally as well with their own strategies. Freston and Drew (1974)

manipulated both presentation and difficulty of the words as a measurement of free recall scores. Only the type of presentation is discussed as relevant for this study. Words were presented to the children in categorical and random orders. There was no difference in recall of the unrelated words as compared to the recall of words organized into categories. The authors concluded that LD children were not sensitive to conceptual organization of the experimenter but used their own strategies. Later these results were replicated by Parker, Freston, and Drew (1975) with a varied population of LD children based on a behavioral instead of a medical description and a control group of 30 normal children.

Ring (1976) reported a contradictory result in her study of the effectiveness of organizational input with LD children. The disparate finding may be due to methodological differences among the studies as Ring used temporal groupings instead of conceptual for organization of the stimuli. Ungrouped tests of words were separated by equal time intervals with each stimulus presented separately while, in the blocked presentation, the equal time intervals occurred after the presentation of a group of items. These subjects in the blocked presentation performed significantly better on

recall than those in the ungrouped presentation. Ring's (1976) explanation for the conflicting findings between this study and those of Drew and colleagues was based on the task requirements and individual characteristics of the population. Ring maintained that the categorical organization was more linguistically complex and beyond the language processing skills of the LD child so they used other strategies. Ring continued that the LD children seemed unable to process the categorized nature of the learning materials in the organized presentation, i.e., they were either unaware of or could not make use of the experimenter-imposed organizational structure.

There are other possible reasons for the difference in results. The age of the subjects differed. In Ring's study the mean age was seven years, seven months while Drew and colleagues reported a mean age of nine years, eight months. Moreover, Drew presented twelve separate lists of five words each for recall while in Ring's study the list was longer than five words. It is possible that the small number of words in the list comprised by Drew and associates produced a ceiling effect as it is highly likely that recall of five items was within the short term memory span of many of the LD students in Drew's study.

Summary

It appears that for many subjects self-imposed strategies are just as effective as experimentally imposed for recall of material (Ausubel & Fitzgerald, 1962; Bousfield, 1965; Freston & Drew, 1974; Parker, Freston, & Drew, 1975). Conversely, for many subjects experimental organization is more effective than self-imposed strategies for recall of materials (Ausubel & Fitzgerald, 1962; Bousfield, 1965; Cobb & Barnard, 1971; Gerjuoy & Alvarez, 1969; Gerjuoy & Spitz, 1966; MacMillan, 1972; Ring, 1976; Reiss & Reiss, 1971).

It seems that effectiveness may depend, in part, on the individual characteristics of the subjects (Ausubel & Fitzgerald, 1962; MacMillan, 1972; Ring, 1976; Tenney, 1975). An examination of the procedures in the studies with LD suggests the possibility of an age and short term memory influence.

Effects of Age on Verbal Learning

These same types of conflicting results have been found among the normal population. In a study of organization structure in paired-associate learning, Rosen (1971) discovered that instructions to associate the paired items in some way only associated those subjects in Grade V. The paired-associate task was presented to 180 children in Grades I, V and IX. The children in

each grade were divided into three experimental groups. In the conditioned group, the children were told to think of associations for the pairing such as you use a hose to water a daisy during the study trials. In the rehearsal group the children were told to say the stimulus twice and then response twice, i.e., daisy, daisy, and hose, hose. In the standard direction group, the children were presented with the pairing and were told they would have to recall these items at some time. Five study trials were given, followed by a test trial.

Those children in Grade I showed no significant difference in performance whereas the performance of Grade V subjects was greatly facilitated by the conditioned instructions. Grade IX subjects performed just as well in the standard and conditioned instructions.

In an evaluation of Rosen's procedures, Moely and Jeffrey (1974) noted that in the conditioned treatment the subjects were given only one example of an association and then asked to form another such link. They questioned whether the younger subjects followed the instructions to associate the words.

In their study, Moely and Jeffrey (1974) discovered that young children ages six to seven years could be taught to use an organizing technique by direct teaching of the associations on all list items and instructing the subjects to study and recall the items

in category sets. This same benefit for younger children was found in the Tenney (1975) study with six- and eight-year olds and the Nelson study with eight-year olds. It appears from all the studies but Rosen's that younger children benefited from the structure and there is a question of her methodology.

It has also been shown in many studies that children improve with age in their ability to organize stimuli and build associations on their own without experimental input. Bousfield, Esterson, and Whitmarsh (1958); Cole, Frankel, and Sharp (1971); and Moely, Olson, Halwes, and Flavell (1969) found that subjective organization increases in grades one through nine.

Aaron, Malathesha, and Schwie (1974) administered a free recall task to 124 children belonging to four different age levels--kindergarten, second grade, fourth grade, and seventh grade. The material consisted of 16 line drawings of common objects that could be grouped into four categories of four items each. Five trials were administered. The subjects' protocols were analyzed in terms of four dependent variables: viz., clustering measure, serial order of recall, priority of newly recalled or previously unrecall items, and categorical intrusions.

Performance of the subjects in each group was

then divided into the two categories of high organizers and low organizers. The results showed that the number of items recalled by the high and low organizers of the two younger groups were significantly different from each other. The number of items recalled by the low organizers in the older groups was not significantly different from the highest. The authors concluded that older subjects employed a number of strategies besides experimenter-imposed organization for processing information. The strategies as identified by the authors included previously unrecalled items, mnemonic devices, and simple rote learning. Conversely, younger children did not utilize such a variety of operations but seemed to rely more on those suggested by the experimenter.

This same result was found by Tenney who discovered 11-year olds performed just as well with subject-directed memory strategies while those age six and eight benefited from strategies devised by the experimenter. This finding was summed up adequately by Nelson (1969) in her analysis that young children can be taught to organize input, but that with increasing age a subject acquires many more strategies.

Effects of Memory on Verbal Learning

Another possible explanation for the incongruous findings may be found in the difference of short term

memory performance of the subjects. Aaron, Malathesha, and Schwie (1974) reasoned that the subject, no matter what the age, would not need to resort to more complex information strategies if the words to be learned could be handled in the short term memory operation. Drew and Altman (1970) found that for normal subjects success of organization depended on whether the list of words was within the immediate memory span of the subjects. If the subjects could handle the material within their memory span, simpler strategies than categorical organization were used. Bourne (1971) concurred that in a simple verbal learning task mere pairing of the stimulus response may be sufficient for those subjects with good memory.

Nelson (1969) compared immediate memory span with the relationship between a subject's organizing strategy and mean recall and found that this relationship was independent of immediate memory capacity. However, immediate memory span was not compared with recall without the influence of organization scores as suggested in this study.

In summary, it appears for those SLD subjects with good memory, the task may require the use of simple strategies (Aaron, Malathesha, & Schwie, 1974; Bourne, 1971; Drew & Altman, 1970). Conversely, those SLD

children with poor memory may need the extra organization.

Reading Research

A review of word recognition research has not revealed categorical organization with cueing as a strategy in the teaching of isolated words. Word shape, configuration, ascending and descending letters, initial, medial and ending letters, word length, color coding, pictorial cues, contextual cues, and geometric cues are the treatments most often investigated (Groff, 1975; Kiraly & Furlong, 1974; Knoke, J., 1972).

If organizational input has been utilized at all, it has most often adopted the format of a comparison between minimal and maximal contrast lists (Hartley, 1970; McMullen, 1972; Otto & Pizillo, 1970). The minimal list is composed of words that are usually grouped by common visual elements such as list, fish, or cake, rake. In this list, elements of the words are held constant. The maximal list is composed of such words as fish, moon, and dog. In this list none of the elements within the words is held constant. Results of this type of study specified that the minimal list was easier to learn.

Summary of Literature Review

A review of the related areas of literature has produced some guidelines for investigation of this

problem. The work of Terrace (1966), Martin (1968), and Samuels (1973) demonstrates it is possible for the researcher to control the relevant features of the stimuli attended to by the subject. The studies by Shuell (1968) and Strand (1970) demonstrate that categorical organization can serve as a relevant stimulus for adults during a verbal learning task. The technique of organizing the input according to categories is employed in this study as the relevant stimulus in an association task.

Review of the verbal learning research in organization of input suggests that some subjects used self-directed organization while others used experimental imposed (Ausubel & Fitzgerald, 1962; Bower & Winzinz, 1969; MacMillan, 1972). This same difference is evident from past studies with LD children by Drew and his colleagues (Freston & Drew, 1974; Parker, Freston, & Drew, 1975; Ring, 1976). Possible explanations for these disparate findings may be that individual characteristics of the subject are interacting with treatment (Ausubel & Fitzgerald, 1962; Cronbach & Snow, 1969; Ring, 1976).

The results of research into the effects of chronological age on verbal learning imply that younger children (six to eight years) when made aware of cues

rely on experimental-imposed organization while older children (nine years and older) often rely on self-directed strategies (Aaron, Malathesha, & Schwie, 1974; Bousfield, Esterson, & Whitmarsh, 1958; Cole, Frankel, & Sharp, 1971; Moely, Olson, Halwes, & Flavell, 1969).

The individual characteristic of short term memory performance may also influence whether a self-directed strategy or experimental-imposed one is selected. Implications from the literature review lead to the possibility that those subjects with adequate short term memory may use simpler strategies than the categorical organization while those with poor memory may require that external organizational structure (Aaron, Malathesha, & Schwie, 1974; Bourne, 1971; Drew & Altman, 1970). Therefore, the interactions between the individual characteristics of short term memory with treatment and chronological age and treatment are examined.

Many of the procedures used in other verbal learning studies are adopted for this study. The words are presented to the subjects using the study method of paired-associate as in the Rosen study. This procedure allows for a study trial where the S-R pairs are presented one at a time and then a test trial where the S is presented alone.

The treatment procedures are selected from those used in the verbal learning research where the effectiveness of categorical organization devised by the experimenter and random presentations were compared. In the random presentation of this study structure is not provided by the experimenter; thus, the subjects are permitted to use their own strategies without the interference noted in the experiment by Bower and Winzinz (1969). Cueing is added to the categorical strategy to assure that the young child is aware of the organizational structure as recommended by Moely and Jeffrey (1974), Nelson (1969) and Tenney (1975).

Just as in the Nelson (1969), Samuels (1973), Rosen (1971) and Schulz, Miller and Radtke (1963) studies, the sessions continue until a particular criterion on the test trial is met. The dependent measures consider both performance and trial criteria as in the study by Aaron, Malathesha, and Schwie (1974).

CHAPTER III METHODS

Null Hypotheses

The following null hypotheses are investigated to answer the questions presented in the statement of purpose:

1. There is no interaction between short term memory and the category-cued and random drill strategies in the number of words learned and trials during immediate recall.
2. There is no interaction between chronological age and the category-cued and random drill strategies in the number of words learned and trials during immediate recall.
3. There is no interaction between short term memory and the category-cued and random drill strategies in the number of words learned and trials during 24-hour recall.
4. There is no interaction between chronological age and the category-cued and random drill strategies in the number of words learned and trials during 24-hour recall.
5. There is no interaction between short term memory and the category-cued and random drill strategies

in the number of words retained over a seven-day period.

6. There is no interaction between chronological age and the category-cued and random drill strategies in the number of words retained over a seven-day period.

Subjects

The subjects for the study were drawn from male Caucasians, ages seven through ten, who had been identified as SLD based on the Orange County, Florida guidelines and were currently enrolled in SLD programs. These guidelines included an I.Q. of 70 or above, a significant deficit in both academic and processing areas and exclusion of mental retardation, emotional disturbance, and a physically handicapping condition.

Significance in academics was determined by a cutoff score of 75% of expectancy age (E.A.) in one academic area excluding spelling for the seven- to nine-year olds and 65% of E.A. for the ten-year olds. The cutoff score of 80% of E.A. on three or more process subtests or 70% of E.A. on one process subtest along with supportive observation data were used to identify a significant process deficit. Expectancy age was calculated by the formula

$$\frac{2MA + CA}{3}$$

(see Appendix A for more detailed county guidelines).

One hundred of these students were pretested using the pool of words. Any student who read enough words which made it impossible to create four separate categories of four words each was eliminated from the group of possible subjects. Fifteen subjects were eliminated due to that reason. Of the remaining 85, students were randomly selected so that 16 were chosen from each age group resulting in a total of 64. Of these 64, three parents refused permission for participation so three others were selected from the remainder of the original 85. Eight of the subjects from each age group were then randomly assigned to the category-cued and eight to the random drill groups totalling 32 subjects in each group.

Fifty-four of the subjects were enrolled in special schools while ten of the seven-year olds were enrolled in resource rooms. Five of the students from the resource rooms were assigned to the category-cued group and five to the random drill. The ten were selected from resource rooms as the younger children in the special schools tended to be identified as language disordered instead of learning disabled.

The socioeconomic level of the subjects is reported according to the occupations of the parents. The rankings of occupations were secured from the Warner Scale (Warner, 1960) and are presented in Table 1 along with

the mean age and mean score on the aptitude and pretest measures for each group.

TABLE 1

COMPARISON OF THE TWO GROUPS ON THE VARIABLES OF AGE,
SHORT TERM MEMORY SCORES, PRETEST SCORES AND
PARENT OCCUPATIONS

	Category-Cued		Random Drill	
	\bar{X}	SD	\bar{X}	SD
<u>Age</u>	107	14.38	105.97	14.86
<u>STM Score</u>				
Detroit	208.41	41.33	215.56	39.61
ITPA	23.78	7.59	27.25	9.50
<u>Pretest Score</u>	21.03	13.72	20.91	15.29
<u>Occupation</u>				
Clerks & Kindred Workers	0%		5%	
Skilled	41%		58%	
Semi-skilled	18%		16%	
Unskilled	29%		21%	
Unemployed	12%		0%	

Four analyses of variance were calculated using the SPSS Subprogram Oneway (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). There were no significant differences between the groups on age, short term memory scores, and pretest scores.

The majority of parental occupations fell in the skilled area for both groups. In the Warner scale the classification of skilled includes such groups as carpenters, electricians, plumbers, and welders.

All of the subjects who began the experiment were able to complete it. However, two of the control group subjects were absent for three days of the experiment and three of the experimental group subjects were absent: one for a day, one for four days and one for two days. All of these subjects were able to learn the words within the allotted time. The number of weekends and teacher work days was the same for both groups.

Materials

The word pool used during the pretest consisted of a total of 80 words (approximately 20 words to each category). All of the words were printed on 5 x 7 inch cards (see Appendix B for a copy of the pool of words).

A total of 16 words, four from each of four categories, was presented to the subjects. Four words to each category have been recommended by Dallett (1964) in a study with university students and Hartley (1970) in a study with first graders. These words were also

printed on 5 x 7 inch cards. Due to the wide age range of subjects, it was impossible to use the same 16 words for all subjects. Therefore, Word List One was used with 34 of the students (17 from the random drill and 17 from the category-cued) and Word List Two was used with 30 of the students (15 from each group). The four categories of people words, eating words, school words, and size words remained constant for all subjects. See Table 2 for the lists of the words used in the study.

TABLE 2
WORDS USED IN THE STUDY

<u>Word List One</u>	<u>Word List Two</u>
chew	chew
tiny	tiny
board	board
doctor	doctor
huge	huge
pages	pages
knife	knife
grandpa	niece
small	small
bite	gnaw
chalk	divide
father	uncle
ate	swallow
large	large
cousin	cousin
write	pencil

The difference in words presented did not appear to

effect the outcome as some of the subjects who failed to learn all the words had been taught the words in Word List One while others had been taught the words in Word List Two.

Instrumentation

The Auditory Sequential Memory (ASM) subtest of the ITPA and the Auditory Attention Span for Unrelated Syllables (AASUS) of the Detroit were used to assess the short term memory aptitude.

In 1973 a test-retest reliability of .89 on the Auditory Sequential Memory subtest of the ITPA was reported by Sedlak and Weener (1973). Ysseldyke (1973) reported a range of .61-.89 while Paraskevopoulos and Kirk noted .86 for a six-year old group and .80 for an eight-year old group (see Sedlak & Weener, 1973). Construct validity was obtained by Hare, Hammill, and Bartel (1973) "utilizing factor analysis with a principal components solution" (p. 13). They reported a loading of .89 on the auditory sequential memory factor for the ITPA Auditory Sequential Memory subtest.

Test-retest reliabilities are reported for the entire Detroit, but there is none reported for the individual subtests. The authors, Baker and Leland (1959), reported a correlation of .96 based on 48 cases and a correlation of .68 based on 792 cases. The .68

correlation was calculated on children that varied in age from seven to twelve years with an intervening difference of two to three years between testing.

These two subtests were selected as both are commonly administered to SLD children in Orange County, thereby making the test results readily available to teachers. Both subtests were administered by the researcher to all subjects during the study.

Dependent Variables

Three dependent measures of word recognition performance were evaluated: immediate recall, 24-hour recall, and week later recall. The test for immediate recall (Test Trial 2) followed the study trials for each session. The test for 24-hour recall (Test Trial 1) preceded the study trials for each session. Both of these dependent variables were measured daily until the subject read all the 16 words correctly during Test Trial 1 (performance criterion) or after the fifteenth session (trial criterion).

The criterion measures served to notify the experimenter when to terminate the sessions with each student. For the subject who read all 16 words correctly on Test Trial 1 on day number eight, a performance criterion determined the discontinuation of the sessions. For the subject who continued to read less than 16 words

correctly, the trial criterion was imposed and all instruction ceased after the fifteenth session. The basis for the selection of both a trial and a performance criterion is found in much of the paired-associate research where multitest trials were administered (Rosen, 1971; Samuels, 1973; Schulz, Miller, & Radtke, 1963).

Fifteen sessions were selected for the following practical reasons. The study was conducted at a time when it was difficult to block out 15 consecutive school days due to vacations, teacher work days, testing, etc.; the children became difficult to motivate much past that time as determined by the pilot study; it was an estimate of the teacher's tolerance for interruptions. Moreover, Schulz, Miller, and Radtke (1963) used 15 trials in their study.

Total number of words read correctly and test trials were considered in both the immediate and 24-hour recall measures. Performance on week later recall was measured seven days later after the subject had reached either performance or trial criterion and only the number of words retained was evaluated.

Independent Variables

The effects of the aptitude measures of short term memory and chronological age were measured on the two

treatments of category-cued and random drill. For the category-cued treatment, the 16 words were grouped into four categories and all the words from each category were presented together. The four instances of each category were preceded by the experimenter's labeling of the category, i.e., the next words are people words, etc. (see Appendix C for a copy of the category-cued script). The four words within each category and each category were presented in a different arrangement each time during the study trial to control for a serial ordering effect. In the random drill treatment, the 16 words were randomly exposed during each study trial so that no two words from the same category ever appeared together; that is, the teacher merely stated the word and the child repeated after her (see Appendix D for a copy of the random drill script). The order for both presentations was marked on the back of the cards to insure standardization.

Procedures

A pilot study conducted in the summer of 1977 at the University of Florida Summer Center formed the basis for the procedures. Three graduate students from the area of Special Education at the University of Central Florida and the researcher administered the sessions. Each instructed 16 subjects, half with the category-cued

strategy and half with the random drill. Four schools participated in the study.

All administrators attended a training session where both treatment strategies were taught. The researcher demonstrated the techniques with a child while reading the prepared script; then each graduate student demonstrated both techniques while following the written script. Reliability checks were made possible as each session was taped. An examination of a random selection of tapes revealed that the administrators followed the script.

Before the sessions began, teachers in the various classrooms were contacted and asked to administer the pretest of 80 words for two days. The findings from the pilot study emphasized the necessity of presentation of the words more than once to insure a beginning score of zero for all subjects. The researcher then tabulated the results and subjects were selected from a group who missed enough words to qualify and were randomly assigned to the treatments.

The administrators then began the study-test sessions. Each subject was worked with individually. The first session began with an introduction of the task and the study trials where the administrators presented the words reading from either the category-cued or random drill script. During the study session, each word was

presented for approximately five seconds three times for a total exposure of about 15 seconds per word. Each word was printed on a separate card with assigned numbers placed on the back to control for order of presentation. At the end of the three study trials, the immediate recall test (Test Trial 2) was administered.

The next day the second session proceeded in the same manner except the 24-hour recall test (Test Trial 1) began the session. During the test trials, the subjects in both groups were asked to read the words organized in random order according to assigned numbers. No cues were given to either group during the test trials. This second session format continued until the subject either read all 16 words correctly during Test Trial 1 or reached the fifteenth session. The sessions lasted approximately ten minutes with each subject. A graphic display may facilitate an understanding of the procedures (Table 3).

One week after the study-test trials were discontinued either due to the subject's reaching the performance or trial criterion, the test trial for the week later recall variable was administered. Consequently, this final test trial was administered on various days, i.e., one subject who read all the words correctly by session five was given the week-later test before another subject who did not read all the words

TABLE 3

STUDY-TEST SESSIONS

	Test Trial 1 24-Hour Recall	Study Trials	Test Trial 2 Immediate Recall
Session 1		XXX	X
Session 2 - 15	X (each word presented once)	XXX (each word presented three times)	X (each word presented once)

correctly until the eighth session. In an attempt to control for incidental teaching, the regular classroom teachers were given the list of selected words and were specifically requested not to teach any of the words during the days of the experiment.

Each subject's score was recorded daily. A graphic display of a sample of the recording form used is found in Table 4 (see Appendix E for the complete form).

TABLE 4
EXAMPLE OF RECORDING FORM

Sessions	1	2	3	4	5	6	7	8	9	10	...	15	Week Later
----------	---	---	---	---	---	---	---	---	---	----	-----	----	---------------

Date

1. _____
2. _____
3. _____
4. _____
5. _____

Etc.

Test							
Score	2	1	2	1	2	1	2

Count
Correct

Name of subject	_____	School	_____
Date of birth	_____	Administrator	_____
C.A.	_____		
Grade	_____		

The data collection lasted approximately ten weeks as it was impossible due to the graduate students' time frame to work with more than eight children at a time (four in the category-cued group and four in the random drill group).

Design

In order to examine the interactions of the learner characteristics of chronological age and short term memory with treatments, a technique sensitive to individual differences is required. Accordingly, an Aptitude Treatment Interaction (ATI) design was selected. The ATI design for research was first proposed by Cronbach (1951) in his American Psychological Association presidential address as a marriage between experimental and correlational treatment of the data and further developed by Cronbach and Snow (1969). The goal of ATI research is to mesh characteristics of treatments and characteristics of individuals, i.e., to design treatments "not to fit the average person, but to fit groups of students with particular aptitude patterns" (Cronbach, 1957, p. 681). This permits one to examine individual differences in group research. Separate regression equations using stepwise regression were calculated for each of the hypotheses and each aptitude.

Data Analysis

The raw score was recorded separately for the Detroit subtest of Auditory Attention Span for Unrelated Syllables (AASUS) and the ITPA Subtest of Auditory Sequential Memory (ASM). A subject's chronological age was calculated in months for analysis.

The scores for Test Trial 1 and Test Trial 2 for each subject were calculated by the formula NC/NT where NC equals the number of words correctly recalled and NT equals the number of trials. This formula enables consideration of both the number of words learned correctly and the time and has been used in other verbal learning research where performance and trial criteria were evaluated together (Aaron, Malathesha, & Schwie, 1974). Using count correct over time as a measure of academic performance is not new but also in current use by many Applied Behavior Analysts (Lindsley, 1964; Lovitt, 1977; White & Haring, 1976) who consider rate an important measure of performance.

The scores were not calculated daily but when either the criterion of all words correct on Test Trial 1 or 15 sessions was reached as in the verbal learning studies of Rosen (1971), Samuels (1973), and Schulz, Miller, and Radtke (1963). For example, if a subject met the performance criterion on the eighth trial by reading all 16 words correctly, the score was not

analyzed for each test trial during the eight sessions but only on the eighth.

Performance on the week later recall was calculated according to the formula $100 \times \frac{CT - CR}{CT}$ adapted from the verbal learning studies that measured delayed retention (Barrett, Maier, Ekstrand, & Pellegrino, 1975; Strand, 1975). CT equals the total count correct for Test Trial 1; CR represents the count correct on the week later recall test. This formula adjusts for initial differences in scores on Test Trial 1. If this were not considered, a child who learned all 16 words during the 15 days automatically had an opportunity to score higher than a child who only learned 12 words.

The SPSS Stepwise Regression program (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) was used to examine the data according to the steps suggested by Kerlinger and Pedhazur (1973) for an interaction analysis. Figure 2 illustrates the steps involved in the regression analysis. Only Step One is explained in detail as the analysis was terminated after this step.

Step One

The full model ($Y' = b_0 + b_1x_1 + b_2x_2 + b_3x_1x_2$) was analyzed first to determine if the main effects and interaction explained a significant proportion of the variance in each dependent measure.

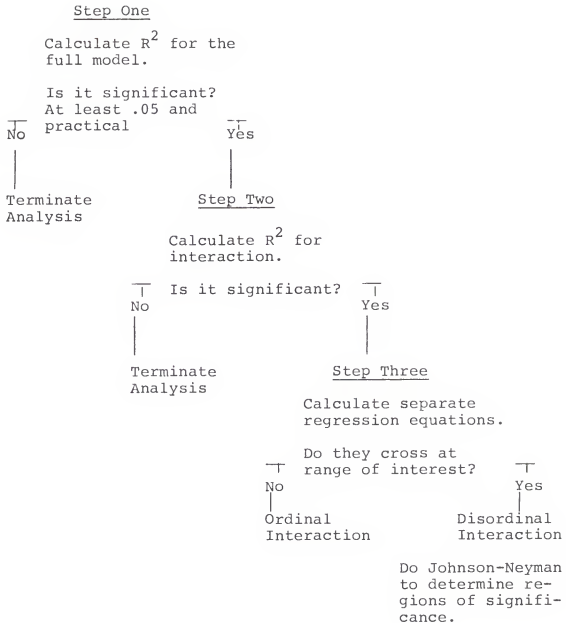


Figure 2. Flow Chart for Regression Analysis

In this model, the b_0 represents the constant; the b_1x_1 represents the coefficient times the aptitude (one main effect); the b_2x_2 the coefficient times the treatment (the other main effect); the $b_3x_1x_2$ the coefficient times the aptitude times the treatment (the interaction effect). There were three full models for each dependent variable: One dealt with the short term memory aptitude as measured by the ASM of the ITPA; another dealt with the short term memory aptitude as measured by the AASUS subtest of the Detroit; the last dealt with the chronological age aptitude. Therefore, a total of nine separate regression equations was analyzed as there were three dependent variables.

The R^2 for each model was calculated and evaluated as to both practical and statistical significance. Alpha was set at .05.

CHAPTER IV RESULTS

The study was conducted to investigate the interaction of learner characteristics with two instructional methods used in the teaching of isolated words to a SLD population.

Sixty-four SLD males from the Orange County public school system were randomly selected from the seven through ten age groups. Sixteen children from each age group were then randomly assigned to the two treatments. Eight children from each age group were assigned to the category-cued and eight were assigned to the random drill, totalling 32 children in each treatment group.

It was hypothesized that not one treatment was best for all children, but that the strategies would interact with chronological age and short term memory on the dependent variables of immediate recall, 24-hour recall, and week later recall.

Data were analyzed using a stepwise multiple regression procedure (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). The chapter is divided into sections which correspond with the null hypotheses. The raw scores for each subject on each variable may be

found in Appendix F. The means and standard deviations for each of the dependent variables are presented in Table 5.

TABLE 5
MEANS AND STANDARD DEVIATIONS OF THE GROUPS ON
THE THREE DEPENDENT MEASURES

	Immediate Recall		24-Hour Recall		Week Later Recall	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Category-Cued	3.50	2.10	3.28	1.88	3.72	5.03
Random Drill	2.56	1.73	2.45	1.76	3.92	8.47

Sixteen percent of the subjects did not meet the performance or trial criterion. Table 6 presents a comparison of the various measures for these subjects.

TABLE 6
COMPARISON OF SUBJECTS WHO DID NOT MEET
EITHER PERFORMANCE OR TRIAL CRITERION

	Category-Cued	Random Drill
	\bar{X}	\bar{X}
Age	7.9	7.10
Detroit AASUS Score	194	216
ITPA ASM Score	15.8	22
Pretest Score	4.8	5.3
Score on 24-Hour Recall	13.5	10.8

Four of the subjects were members of the category-cued group and six were members of the random drill group.

Six of the subjects were assigned to the words found in Word List 1 and four of the subjects were assigned the words in Word List 2.

Immediate Recall Variable

Short Term Memory Aptitude

Null hypothesis number one states that there is no interaction between short term memory and the category-cued and random drill strategies in the number of words learned and trials during immediate recall. Results for this hypothesis were analyzed separately for the Detroit AASUS and the ITPA ASM subtests. Correlations of the short term memory variables are presented in Table 7.

TABLE 7

CORRELATIONS FOR SHORT TERM MEMORY VARIABLE

	Detroit AASUS	ITPA ASM
Immediate Recall	.25	.20
Treatment	.09	.20
Detroit X Treatment	.08	
ITPA X Treatment		.26

None of the correlations was significant. Data from test performance on short term memory as measured by the Detroit AASUS are presented first. The data were analyzed using a stepwise multiple regression technique. The R^2 of .13 based

on the variables of short term memory, treatment, and the interaction of short term memory and treatment was statistically significant, $F(3,60) = 3.04$ $p < .05$. However, as the main effects (aptitude and treatment) and interaction (treatment x short term memory) accounted for only 13% of the variance in the dependent measure of immediate recall, the result was judged to lack practical significance (Kerlinger & Pedhazur, 1973) and the analysis was terminated. There was failure to reject the null hypothesis.

Data for the ITPA ASM performance yielded an R^2 for the full model of .14, $F(3,60) = 3.27$ $p < .05$. This was statistically significant although again judged to be of no practical significance.

Chronological Age Aptitude

The second hypothesis deals with an examination of the effects of chronological age on the dependent variable of immediate recall. There is no interaction between chronological age and the category-cued and random drill strategies in the number of words learned and trials during immediate recall. The correlations of the chronological age variable are presented in Table 8.

TABLE 8

CORRELATIONS FOR CHRONOLOGICAL AGE

	<u>Chronological Age</u>
Immediate	.21
Treatment	-.04
CA x Treatment	-.03

There are no significant correlations. The interaction data were again analyzed using a stepwise multiple regression technique. The R^2 for the full model of main effects and interaction was statistically significant, $F(3,60) = 3.23$ $p < .05$. However, as the variables only accounted for 14% of the variance in the dependent measure, the results were judged to lack practical significance and analysis was terminated. There was failure to reject the null hypothesis.

Summary of Immediate Recall Results

The R^2 for the full model for each hypothesis was tested and found to lack practical significance in that the proportion of variance accounted for by the main effects and interaction was too small to be meaningful. Consequently, there were insufficient data to reject the null hypotheses of no difference in treatment based on a chronological age and treatment interaction. Similarly, there were insufficient data to reject the null

hypothesis based on a short term memory and treatment interaction on the dependent variable of immediate recall.

24-Hour Recall Variable

Short Term Memory Aptitude

The hypothesis states that there is no interaction between short term memory and the category-cued and random drill strategies in the number of words learned and trials during 24-hour recall. The performance on the Detroit AASUS was correlated with the dependent variable. The R^2 for the full model was insignificant $F(3,60) = 2.60$ $p > .05$. Analysis was terminated with the result of failure to reject the null hypothesis.

Short term memory aptitude as measured by the ITPA ASM produced an R^2 of .15 $F(3,60) = 3.39$ $p < .05$. This was judged to be of no practical significance as the factors of short term memory as measured by ITPA, treatment and the interaction only accounted for 15% of the variance in the dependent measure of 24-hour recall. The null hypothesis was not rejected. Performance on the ITPA correlated .21 with the dependent measure.

Chronological Age Aptitude

Data were next analyzed to test the null hypotheses that there is no interaction between chronological age and the category-cued and random drill strategies in the

number of words learned and trials during 24-hour recall. Chronological age was correlated .23 with the dependent variable. The R^2 for the entire model as analyzed by a stepwise multiple regression procedure proved statistically nonsignificant, $F(3,60) = 2.64$ $p > .05$. Therefore, the null hypothesis was not rejected.

Summary of 24-Hour Recall Results

A stepwise multiple regression procedure was used to analyze the data. The R^2 for the entire model when short term memory was measured by performance on the Detroit AASUS was statistically insignificant. Similarly, the R^2 for the entire model dealing with the aptitude of chronological age was statistically insignificant. Although the R^2 for the entire model when short term memory was measured by the ITPA ASM was statistically significant, the difference was evaluated to lack substantive meaning. Therefore, the null hypotheses of no difference between treatments based on chronological age and treatment interaction and an STM and treatment interaction on the dependent variable of 24-hour recall were not rejected.

Week Later Recall

Short Term Memory Aptitude

There is no interaction between short term memory and the category-cued and random drill strategies in

in the number of words retained over a seven-day period. The R^2 for the full model was insignificant whether short term memory was measured by the Detroit AASUS or ITPA ASM: Detroit = $F(,360) = .038$ $p > .05$; ITPA = $F(3,60) = .23$ $p > .05$. The stepwise multiple regression procedure indicated failure to reject the null hypothesis. Performance on the Detroit AASUS was correlated .02 with the dependent measure and performance on the ITPA ASM was correlated .11.

Chronological Age Aptitude

The R^2 for the entire model of chronological age, treatment, and interaction between chronological age and treatment was insignificant, $F(3,60) = .05$ $p > .05$.

The null hypothesis of no interaction between chronological age and the category-cued and random drill strategies in the number of words retained over a seven-day period was not rejected.

Summary of Week Later Recall Results

The data for all hypotheses dealing with the dependent variable of week later recall were analyzed using a stepwise multiple regression procedure. In each instance, there was failure to reject the null hypothesis.

Summary of the Multiple Regression Results

Neither short term memory performance nor chronological age interacted with treatment on any of the dependent variables. Therefore, all the interaction hypotheses were statistically and practically insignificant.

CHAPTER V DISCUSSIONS AND CONCLUSIONS

Numerous investigations demonstrated that immediate free recall of verbal material organized in terms of conceptual categories is superior to that of a random list. These positive research results lead many educators (Bannatyne, 1971; Freston & Drew, 1974; Parker, Freston, & Drew, 1975; Ring, 1975) to speculate that the categorical strategy of organizational input is an effective method in the teaching of academic skills to the exceptional population of Specific Learning Disabilities (SLD). Recently, Westling and Mercer (1977) recommended a categorical presentation specifically for the instruction of isolated words. Mercer and Snell (1977) further suggested that the task include labeling of the categories.

Past verbal learning research with mentally retarded children produced positive results of categorical organization on recall (Gerjouy & Alvarez, 1969; Gerjouy & Spitz, 1966; MacMillan, 1972; Reiss & Reiss, 1971). However, equivocal findings were reported for investigations with the target populations of Specific Learning Disabilities and normal children. Parker, Freston, and Drew (1975) and Freston and Drew (1974)

reached the conclusion that SLD children do not use experimental imposed categorical input while Ring (1976) reported a positive effect. It is possible that one of the reasons for the disparate findings is that certain learner aptitudes are interacting with treatment. There is both theoretical and empirical support for the position that learning effectiveness is a function of the interaction of instructional treatment and learner characteristics (Ausubel & Fitzgerald, 1962; Cronbach & Snow, 1969).

In their research with normal children, Aaron, Malathesha, and Schwie (1974), and Tenney (1975) recognized an age-related effect where younger children profited from externally imposed organization while older children seemed to use the strategy as one of many for recall. The results of other studies indicated that children improved with age in their ability to organize stimuli and build associations on their own (Bousfield, Esterson, & Whitmarsh, 1958; Cole, Frankel, & Sharp, 1971; Moely, Olson, Halwes, & Flavell, 1969). These studies led to the consideration of a possible age-related effect.

Furthermore, many researchers and theorists (Aaron, Malathesha, & Schwie, 1974; Bourne, 1971; Drew & Altman, 1970; Nelson, 1969) believe that subjects may not need to resort to more complex information processing

strategies in simple learning situations if short term memory is adequate. Only Nelson (1969) investigated short term memory in organizational input studies and this was independent of recall effect.

Accordingly, the purpose of this study was to investigate the interaction of the learner characteristics of chronological age and short term memory with strategies used in the teaching of isolated words to SLD children. The strategies included a categorical organization with cueing and a random drill. In the category-cueing strategy the experimenter presented each word on a flash card to the subject labeling the category membership. In the random drill the experimenter presented each word on a flash card in random order so no two words from the same category ever appeared together.

Discussion of the Findings

Chronological Age

The analysis of the data resulted in no significant interaction between chronological age and treatment on any of the dependent variables whether immediate, 24-hour, or week later recall. The lack of a relationship between age and the category-cued strategy is in disagreement with much of the verbal learning research where younger children profited from such an approach.

Perhaps, the difference lies in the task requirement. The task in this study was an academic one where the subjects had to associate from memory a verbal response (say man) to a visual stimulus (flash card with word man). In other verbal learning research the task most often involved free recall where the subject was presented a list of words either in random or categorical order and then instructed to recall as many of the words as possible from memory. No specific order was required in the recall. The reading task of this study is more comparable to paired-associate learning where the response has to be matched to each individual stimulus and recall cannot be free. Even in the paired-associate study (Schulz, Miller, & Radtke, 1963) where categorical organization was used, the subjects were not required to read the stimulus. Furthermore, the sequence of the categories was manipulated during the test trial so that the words from the same category appeared together unlike this study where the words for the test trials appeared in random order.

In addition, the use of a reading task limited the choice of age groups. Many five- and six-year old SLD students are not ready for word recognition activities and for many of the older students word recognition is not a problem. This was evident as it was

difficult to find ten-year olds who qualified for inclusion in the study. The most successful studies that discovered an age effect compared subjects over a wide age span somewhere between the ages of five and fourteen. Wachs and Gruen (1971) identified the requirements of both a wide range of age groups and nonadjacent groups for statistical significance.

The study appears to suffer from the same methodological problems as in the study by Rosen (1971) where the cues were not specific enough for each stimuli. Stimulus discrimination and control research have shown that there should be a relevant dimension attended to in each stimulus. The properties of effective cues include that a cue carefully direct the students' attention exactly to the distinctive feature (Gibson, 1965) and that the cues should emphasize relevant aspects of the stimulus so that the cue cannot be ignored (Allington, 1975). As found in the research, younger children only profited from the category strategy devised by the experimenter if they were made aware of the structure. In this study, three of the seven-year olds out of four in the category-cued treatment failed to learn all the words. The presentation of the words in blocks of four only cued the subject that four words were from a particular category, but each of the four words was not accompanied with individual cues.

Short Term Memory

There was no significant interaction between short term memory and treatment on immediate recall, 24-hour recall, and week later recall. The reason for the lack of a relationship between short term memory and treatment may again be that the task was not a simple paired-associate memory task, but one that involved first discrimination and then memory. During the instructional sessions when given the cue the next four words are eating words, many subjects would say all four words before the cards were presented, and yet could not read the individual words printed on the flash cards. They obviously could recall the words, but could not associate each word to the separate visual stimulus, a task requiring more than memory.

Week Later Recall

That no interactions were produced with week later recall is not surprising. The organizational input studies examining main effects of treatment differences have demonstrated that even though rate of learning may differ based on treatment, delayed retention scores do not when a criterion level of performance is imposed (Strand, 1975; Wortman, 1975). In this study, a criterion level of performance along with a trial criterion was imposed. Eighty-four percent of the children reached

the performance criterion in both treatments. Research by Gregory and Bunch (1959), Schoer (1962), and Underwood (1954) demonstrated that fast and slow learners forget at the same rate when the degree of original learning is the same. Schuell and Keppel (1970) and Samuels (1973) view differences in retention as an artifact produced by different rates and levels of learning in the school setting where time to learn is held constant.

Practical Implications

The recommendation of using categorical organization with cueing in the teaching of isolated words for younger children and for children with poor short term memory skills from the SLD population has not been supported in this study. It is suggested that if teachers use such an organization structure in the teaching of sight words it might be more effective to provide other cues for decoding in addition to categorical membership. For instance, the fact that black begins with the b sound might be used in addition to the concept that black is a color word.

Suggestions for Future Research

Ausubel and Fitzgerald (1962) found that advanced organizers tended to be more effective for students with

relatively poor verbal ability and less than average general or immediate background knowledge in the learning task. Scores on the pretest of the pool of words differed for the children in this study. A range of 0 to 49 is recorded. Previous word knowledge as measured on this pretest represents an estimate of general background knowledge and therefore, may have been a better selection of an aptitude.

In retrospect, the procedures on the test trials placed the category-cued group at a distinct disadvantage. The words were presented in random order during the test trials for both groups. For the random drill this was a familiar learning set as this was the order of presentation during the study trials. This was not the case for the category-cued as the words were grouped during the study trials and then presented ungrouped during the test trials. Consequently, the test trials for the category-cued group are more of an assessment of generalization ability, in that the subjects had to generalize the words from a grouping pattern to a non-grouping pattern.

In the verbal learning research measuring free recall with cueing (Nelson, 1969; Tulving & Pearlstone, 1966; Wood, 1967) the presentation order remained constant during both the study and test trials. This was

also the procedure in the paired-associate study with the categorical arrangement (Schulz, Miller, & Radtke, 1963); the categories were blocked together during both study and test trials. For further research if a reading task is selected, it is suggested that the words be presented during test trials in the same manner as during the study trials, i.e., the category-cued grouped with labels and the random drill not grouped.

Future researchers might pursue the effectiveness of a category-cued strategy with the more traditional task of free recall with the SLD population. Questions such as are SLD students aware of the experimental-imposed organization and is cueing more effective at recall or at input remain unanswered. In conclusion, it is recommended that more research should be conducted in the area of organizational input with the SLD population patterned after the research of Aaron, Malathesha, and Schwie (1974); Tulving and Pearlstone (1966); and Wood (1967). These more traditional verbal learning questions need to be answered first before the technique is applied to academic tasks.

APPENDIX A

ORANGE COUNTY GUIDELINES FOR SLD PLACEMENT

Orange County District Procedures definition of Specific Learning Disabilities, adopted from the Florida Statute 6A-6.3018, is as follows:

"Specific learning disability--one who exhibits a disorder in one or more of the basic psychological processes involved in understanding or using spoken and written language. These may be manifested in disorders of listening, thinking, reading, talking, writing, spelling, or arithmetic. They do not include learning problems which are due primarily to visual, hearing or motor handicaps, to mental retardation, to emotional disturbance, or to environmental deprivation."

The criteria for eligibility are:

On the basis of an individual intelligence test, the intellectual functioning of the subject is not more than two standard deviations below the mean. Using the mental age and chronological age of the subject, an expectancy age is derived by following formulas:

$$\text{C.A. under 8-5} \quad \frac{2MA + CA}{2}$$

$$\text{or} \quad \frac{2MA + CA}{3}$$

or C.A. over 12-0

$$\frac{3MA + CA}{4}$$

The expectancy age is used in qualifying the subject for eligibility.

The subject must display a disorder in one or more of the psychological processes previously mentioned in order to qualify for eligibility. The subject must possess one disorder less than 70% of his expectancy age and/or three disorders less than 80% of his expectancy age.

Based upon the student's expected level of functioning, a score of 85% of expectancy age or below for 3-6 years of school attendance; 75% of expectancy age or below for 7-9 years of school attendance; or 65% of expectancy age or below for 10 or more years of school attendance in one or more of the following academic areas:

- a. oral expression
- b. listening comprehension
- c. written expression
- d. basic reading skills
- e. reading comprehension
- f. math calculation
- g. math reasoning

For students in grades K-1, evidence indicating substantial weakness on pre-academic tasks must be present.

APPENDIX B
POOL OF WORDS
PRETEST

Eating Words

water
ate
cut
drink
eat
full
chew
gulp
sip
dine
lick
bite
gnaw
crunch
swallow
gulp
knife
spoon
fork

School Words

draw
board
know
word
write
read
think
thought
sing
letter
book
pencil
pages
chalk
desk
pen
notebook
eraser
number
divide
multiply

Size Words

big
light
little
long
large
small
tiny
huge
short
tall
fat
thin
heavy
thick
wee
narrow
wide
broad
skinny

People Words

mother
boy
brother
girl
friend
father
men
man
children
people
teacher
sister
woman
cousin
farmer
doctor
grandpa
uncle
niece
aunt
nephew

APPENDIX C

CATEGORY-CUED SCRIPT

Introduction

Teacher: We are going to learn some new words. We will be working with the words for awhile. Let's get started.

Instructional Trial I

The words that we are going to learn go together in some way. For instance, the first four words we will look at are people words or words that name different types of people like _____, _____, _____, _____. (Pick up the cards. Show them one at a time to the child.) This is _____. You say it. This is _____. (Do this until all four words have been shown once. You say it may be dropped if the child responds quickly.) The next group of words are school words. Words that tell something about school or make you think about school like _____, _____, _____, _____. (Pick up the cards. Show them one at a time to the child.) This is _____. You say it. This is _____. You say it. (Do this until all four words have been shown once.)

The next group of words are eating words or some words that tell something about eating or make you think of eating, like _____, _____, _____, _____. (Pick up the cards. Show them one at a time to the child.) This is _____. You say it.

(Do this until all four words have been shown once.)

The next group of words are size words or words that tell something about the size of things, like _____, _____, _____, _____. (Pick up the cards. Show them one at a time to the child.) This is _____. You say it. (Do this until all four words have been shown once.)

Instructional Trial II

(Teacher begins with all words put together and sequenced according to the numbers on the back of the cards assigned to Instructional Trial II.) Let's try these school words. (Show each of the four school words according to the number on the back of the cards.) (Say word, have child repeat each word once.) Now let's try the eating words. (Say word, have child repeat each word once.) Now let's try the people words. (Say word, have child repeat each word once.) Now let's try the size words. (Say word, have child repeat each word once. At the end of the presentation, say good job. Then say, one more time and then it's your turn.)

Instructional Trial III

(Sequence the words according to the numbers on the back of each card for Instructional Trial III.) Let's try these eating words. (Say each word, child repeats.)

Here are some size words. (Say each word, child repeats.) Let's try the school words. (Say each word, child repeats.) Let's try the people words. (Say each word, child repeats.) (At the end of the presentation, say good job.)

Test Trials One and Two

Test Trial One is administered before the instructional sessions. Test Trial Two is administered immediately after the instructional session.

(Present each word to the child according to the numbers on the back of the cards for the test trials.) (Record the child's first response only to each word. Give no feedback.) Say now let's see how many words you know. (If child asks if it is correct, say you are doing okay or fine. At conclusion of session, say thank you for your help today.)

APPENDIX D
RANDOM DRILL SCRIPT

Introduction

We are going to learn some new words. We will be working with the words for awhile. Let's get started.

Instructional Trial I

We are going to learn these words today. (Show them one at a time to the child according to the numbers on the back of the cards for Instructional Trial I.) This is _____. You say it. This is _____. You say it. (Do this until all words have been shown one time.) (You say it may be dropped if the child responds quickly.)

Instructional Trial II

Let's try the words again. (Show them one at a time to the child according to the numbers on the back of the cards for Instructional Trial II.) This is _____. You say it. This _____. You say it. (Do this until all words have been shown.) (At this time, say good job. Then say, one more time and then it's your turn.)

Instructional Trial III

Let's try the words again. (Show them one at a time to the child according to the numbers on the back of the cards for Instructional Trial III.) This is _____. You say it. This is _____. (Do this

until all words have been shown. At this time, say good job.)

Test Trials One and Two

Test Trial One is administered before the instructional sessions. Test Trial Two is administered immediately after the instructional session.

(Present each word to the child according to the numbers on the back of the cards for the test trials.) (Say, now let's see how many words you know.) (Record the child's first response only to each word. Give no feedback.) (If child asks if it is correct, say you are doing okay or fine.) (At conclusion of session, say thank you for your help today.)

APPENDIX E
RECORDING FORM

Session	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Week Later
Date																
1)																
2)																
3)																
4)																
5)																
6)																
7)																
8)																
9)																
10)																
11)																
12)																
13)																
14)																
15)																
16)																
Score	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
CC																

Subject _____ C.A. _____
 Date of Birth _____ Grade _____
 School _____ Administrator _____

APPENDIX F
RAW SCORES FOR SUBJECTS

RAW DATA--CONTROL

<u>Subject</u>	<u>Dependent Variables</u>				<u>Independent Variables</u>		
	<u>Immediate Recall</u>		<u>24-Hour</u>		<u>Age</u>	<u>Detroit</u>	
	<u>Words</u>	<u>Trials</u>	<u>Words</u>	<u>Trials</u>		<u>ITPA</u>	<u>Pretest Words</u>
1	16	6	16	6	131	252	31
2	16	3	16	3	127	264	45
3	15	10	16	10	109	240	16
4	16	5	16	8	87	243	15
5	16	6	16	9	84	209	10
6	16	4	16	4	85	187	20
7	15	10	16	10	110	241	15
8	16	5	16	5	130	136	47
9	16	15	16	15	124	182	4
10	16	10	16	15	123	201	20
11	16	4	16	4	99	266	30
12	16	2	16	2	98	236	35
13	16	4	16	5	87	281	28
14	16	9	16	9	94	246	31
15	12	15	12	15	85	238	0
16	16	14	14	15	84	243	1
17	15	5	16	5	119	241	35
18	15	8	16	8	100	200	16

RAW DATA--CONTROL--Continued

Subject	Dependent Variables					Independent Variables		
	Immediate Recall		24-Hour		7-Day	Age	Pretest Words	
	Words	Trials	Words	Trials			Detroit	ITPA
19	16	3	16	3	15	105	209	25
20	9	15	9	15	10	99	243	20
21	16	12	16	12	15	107	121	18
22	9	15	8	15	8	96	146	19
23	16	5	16	5	16	96	182	28
24	16	6	16	6	16	125	211	36
25	16	8	16	9	16	112	211	17
26	16	14	16	15	15	122	172	19
27	16	11	16	12	16	110	270	47
28	15	4	16	4	14	111	224	21
29	16	3	16	3	16	108	220	27
30	16	10	16	10	15	125	157	24
31	13	15	12	15	12	108	214	18
32	11	15	10	15	10	91	212	16

RAW DATA--EXPERIMENTAL

<u>Subject</u>	<u>Dependent Variable</u>				<u>Independent Variables</u>			
	<u>Immediate Recall</u>		<u>24-Hour</u>	<u>7-Day</u>	<u>Detroit</u>		<u>ITPA</u>	<u>Pretest Words</u>
	Words	Trials	Words	Trials				
1	15	2	16	3	15	126		
2	16	4	16	4	14	127	257	30
3	14	11	16	11	15	84	226	25
4	16	12	16	12	15	88	116	15
5	16	8	16	8	15	93	248	26
6	16	6	16	6	16	125	258	30
7	16	3	16	3	16	125	157	24
8	16	9	16	9	16	124	208	24
9	16	4	16	4	15	117	251	28
10	16	14	15	15	16	84	213	19
11	16	9	13	15	13	88	199	15
12	16	4	16	4	16	94	169	8
13	16	6	16	6	16	128	113	18
14	16	15	14	15	13	89	179	30
15	16	4	16	4	15	118	184	15
16	16	2	16	2	16	106	247	15
17	16	6	16	6	14	120	250	30
18	16	6	16	6	14	127	256	31
							180	28
								27

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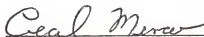
BIOGRAPHICAL SKETCH

I was born enough years ago that subtracting my birthdate would result in an age over 30. Most of my life has been devoted to educational endeavors. I attended a two-room country school where I tutored younger children until ninth grade. I graduated from Glasford High School and fulfilled my career dream of becoming an elementary education teacher upon graduation from Western Illinois University in 1964.

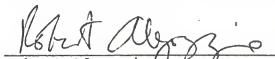
My first job as lead teacher in the special school section of Kankakee State Hospital was quite naturally one I was not overly trained for. The next four years were spent working in regular classrooms. However, my experiences with the "strange" children both in the special school and regular classroom continued to interest me in exceptional education and lead to the completion of a MA degree in Emotionally Handicapped from the University of Iowa in 1969.

The next few years found me returning to Illinois to work as a Psycho-Educational Diagnostician in the Schaumburg School System. Wanting to share my teaching experiences with others motivated me to struggle and complete the requirements for the doctoral degree.

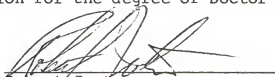
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Cecil Mercer, Ed.D., Chairman
Associate Professor of
Special Education

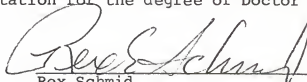
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Robert Algozzine
Assistant Professor of
Special Education

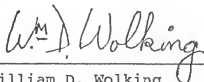
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Robert Jester
Professor of Educational
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Rex Schmid
Assistant Professor of
Special Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



William D. Wolking
Professor of Special Education

This dissertation was submitted to the Graduate Faculty of the Department of Special Education in the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August 1979



Dean, Graduate School